THE CLINICAL JOURNAL.

No. 1067 (Vol. XLII, No. 1). **WEDNESDAY, APRIL 9, 1913.** **Weekly. Threepence.**

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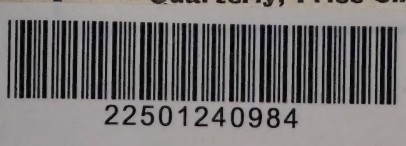

fragment gets between the bones behind, the "locking" will occur during flexion (Fig. 3). A "locking" that occurs either during extension or flexion, sometimes the one and sometimes the other, is due to a pedunculated fragment long enough to reach either the anterior or posterior part of the joint (Fig. 2). *Third*, that in one form of rupture—the bucket-handle variety (Fig. 4)—the displaced fragment may be overlooked during an operation, unless the possibility of such an occurrence is remembered and a careful search made.

April 9th, 1913.

Internal semilunar cartilage of right side to illustrate manner of "locking" in varieties of rupture (semi-diagrammatic). A. Anterior. P. Posterior attachments.

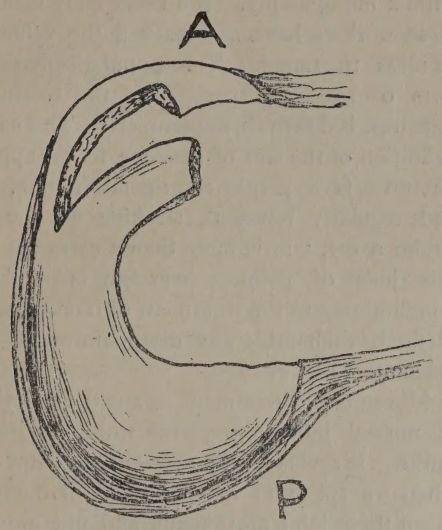

FIG. 1.—The knee cannot be fully extended.

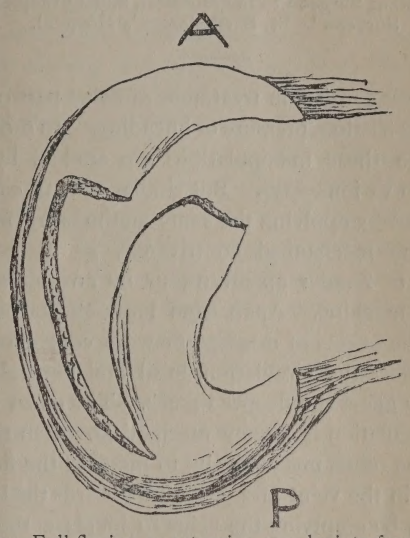

FIG. 2.—Full flexion or extension may be interfered with.

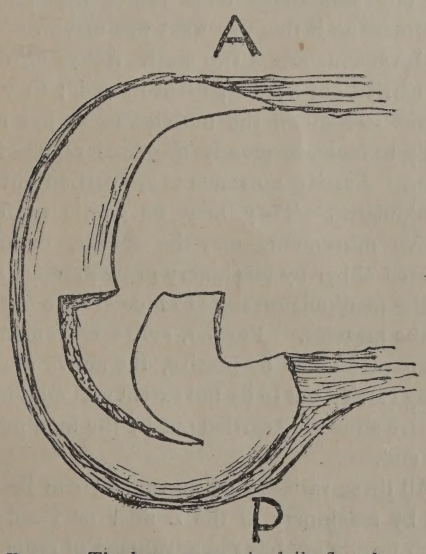

FIG. 3.—The knee cannot be fully flexed.

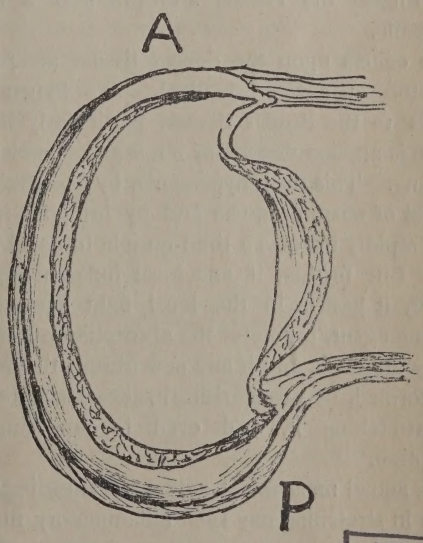

FIG. 4.—Bucket-handle variety of rupture.

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TREATMENT BY MASSAGE AND MOVEMENT, PARTICULARLY IN RELATION TO FRACTURES.*

By R. C. ELMSLIE, M.S., F.R.C.S.,
Assistant Surgeon to the Hospital, and Orthopædic Surgeon to St. Bartholomew's Hospital.

MASSAGE consists in treatment of some part of the body by friction, pressure or kneading. In ordinary massage these manipulations are applied by the hand in various ways. But similar effects can be obtained by applying the same methods by means of some mechanical contrivance, as in certain forms of Zander apparatus, or by an electrically driven machine. Apart from local effects on the skin, the effects of massage may be considered as they affect the circulation, local and general, and as they affect the deeper tissues. The effect upon the circulation is largely mechanical. Centripetal stroking tends mechanically to increase the flow of blood in the veins and of lymph towards the trunk, and so by emptying the veins to increase the rate of flow in the arteries. But in addition to this it soon dilates the vessels and produces a local hyperæmia.

The effects upon the deeper tissues are partly circulatory, partly mechanical. The hyperæmia extends to the deeper tissues, particularly if the friction is applied deeply, or if it is accompanied by kneading. This deep hyperæmia, by assisting the removal of waste products and by bringing nutriment, rapidly restores a tired muscle to its normal state. But further, if any local inflammation is present, it assists in the local fight against an infecting agent, promotes the absorption of inflammatory products, and if any new fibrous tissue has been formed, by vascularising it, assists in softening and stretching it, and even in procuring its absorption.

The actual mechanical action of kneading also assists in stretching any such inflammatory fibrous tissue.

One other local effect of massage must be alluded to. The French school of masseurs have shown that light stroking or friction applied regularly along the same lines over a limb produces after a few minutes an actual local anæsthesia, which affects not only the surface but also the deeper parts, so that pain is relieved, and muscular spasm, due to pain, may even be abolished.

To many masseurs, specially those trained in the strict Swedish school, the idea that massage can be painless seems absurd, and an anæsthetic effect a frank impossibility. But this simply means that these workers have not realised the value of this painless treatment. The popularisation of this form of massage, specially in the treatment of fractures, is due to Championniere. This surgeon's definition of the sort of massage to be applied to fractures is a gentle centripetal friction, slowly and regularly repeated, stroking as you would stroke a cat, "little more than a caress." Unless this idea of painless massage is realised as a preliminary to the treatment of fractures by this method, difficulties and disappointments will be encountered.

Movement in treatment means the carrying out of normal joint movements within their normal limits. It seems hardly necessary to point out that when we speak of moving cases of fracture, we mean these joint movements and not movements of the ends of the fractured bone on each other, yet one sometimes finds critics discussing the treatment as if this was what was meant.

Movements are of two sorts. Active movements are carried out by the patient himself; they will of course strengthen the muscles used, but are not likely to increase greatly the total range of movement. Passive movements are carried out by the manipulator. They may be gentle or forcible. Active movements may be simple, or may be resisted either by machinery or by pressure applied by the manipulator, so as to increase the work done by the muscles. Further, active movements may be supplemented by passive, the active movement being carried out to its full extent and an additional passive stretching carried out by the manipulator at the end.

All these varieties of movement can be carried out by machinery of the Zander or Pendel type. Such machinery has the advantage of reducing the labour of the manipulator, but practically everything that can be done by such machinery can also be done by hand, and done with more accuracy and delicacy.

Movements may be carried out with the idea of preserving the function of a joint, or of improving

* Read at a meeting of the Æsculapian Society.

the function of a damaged joint by restoring its proper range of movement, or with the idea of improving the strength or activity of the muscles. The sort of movement to be employed and the method of carrying it out must depend upon the end desired. And this end should be borne in mind during the treatment.

In order to illustrate practically the uses of massage and movement I propose to take (1) sprains, (2) acute arthritis, and (3) fractures.

Sprains.—A sprain may be defined as a contusion in the neighbourhood of a joint. Pathologically most sprains consist in the tearing of some structure, most often of a ligament. This tearing is followed within a short time by an effusion into or around the joint, first of blood from ruptured vessels, later of exudate from the vessels.

The old-fashioned method of treatment in such cases was to rest the part and apply cold lotions to lessen the effusion, then to rest the joint until the effusion had disappeared, and then to attempt to restore movement. Apart from the waste of time involved this method had another serious disadvantage. An effusion, whether of blood or of plasma, tends, if left, to undergo organisation, fibrous tissue being formed; this results in the production of intra-articular and peri-articular adhesions, which take a long time to stretch or absorb. Indeed, if such adhesions become dense, they may prove incapable of being stretched. A history in a case in which such adhesions arise may go thus.

A patient wrenches his knee, there is considerable effusion, and for this the joint is rested for a month, no movement being allowed. At the end of this time the effusion is gone, but the joint is stiff and the muscles feeble. Movement is then started, but adhesions have formed which are stretched by any but small movements, so that directly any considerable movement is carried out an adhesion is stretched, the joint becomes painful, and the stretching of the adhesion produces a fresh effusion. This effusion is considered an indication for further rest, which in turn produces increased atrophy of the muscles, and allows the adhesions to consolidate again. A vicious circle is now reached, and unless the joint is properly treated, recovery may be indefinitely delayed. The proper treatment of such a joint is to move it fully under an anæsthetic, breaking down all adhesions, to prevent immediate effusion by the method to which I shall refer presently, and to start moving the joint the next day.

To come to a more rational method of treatment. The evident indications are to limit the effusion, to promote its rapid absorption, and to restore the mobility of the joint before any firm adhesions have had time to form. The limitation of an effusion can be most easily carried out by the simple mechanical method of applying pressure. There are two particularly good methods of applying this, each of which has its advantages—by strapping, and by a compression bandage. The second is perhaps the most generally useful, and is specially indicated in those cases where, when a patient is first seen, there is already a good deal of effusion, or where a large effusion is feared. It is carried out thus:

The whole limb for a distance of two or three inches on either side of the joint is swathed in sheets of absorbent wool about an inch thick. A domette bandage is then firmly applied, as much force as is possible being used. A firm elastic compression is thus kept up over the joint and its neighbourhood, and at the same time a certain small amount of movement is allowed. This small amount of movement has a use to which I shall allude immediately. If such a bandage is applied immediately after an injury, when it is removed twenty-four hours later it will generally be found that the effusion is very slight or even absent. Moreover, if such a bandage is applied over a joint into which an effusion has already taken place, it will often be found that this has disappeared in twenty-four hours.

Strapping applied directly to the joint is indicated rather in cases in which there is very little effusion, and particularly in such a joint as the ankle, when there appears to be a risk of the joint falling over into an unnatural position if it is subjected to weight. It has the great disadvantage that its daily removal for massage and replacement is tiresome.

The second object, the rapid removal of the effusion, is effected by massage. In addition to the ordinary methods of massage carried out daily auto-massage may be utilised. If a joint, such as the knee, is covered by a firm compression bandage, it can, in most cases, be moved from the first. The movements are small, because the bandage will

restrict them, but they are sufficient to vary the pressure upon the different parts covered by the bandage. These variations in pressure keep up a certain amount of auto-massage, which hastens the absorption of the effusion.

In order to hasten the recovery of the function of the joint, movements should be carried out from the first. The question arises whether by doing this there is any risk of preventing union of an important ligament which has been ruptured. This must vary in individual cases, but it may be said at once that there is very seldom any such risk. In such a joint as the knee there is practically no risk at all; movements may be carried out passively and actively from the first. And within a few days the joint may be safely used for walking, provided always that the bandage is kept applied. The ankle is an example of a joint in which greater care must be taken, more particularly if some ligament upon the inner side has been ruptured. There will then be a considerable risk of weakening the joint and producing a bad degree of valgus or flat foot. It is in such a case that the advantages of strapping are shown. As soon as the effusion has been reduced, strapping can be applied in such a way as to limit movement in the dangerous direction, in this case movements of eversion and abduction. Movements can then be carried out actively and passively, and very soon weight can be borne.

Cases of simple strain treated by such methods of bandaging, massage and early movement recover quickly. Needless to say it is essential to make an accurate diagnosis in the first place. Not only must a fracture, even the chipping off of a small piece of bone, be excluded, but an accurate estimate of the amount of damage done to the joint should be arrived at at the first examination; this will give the best indication of the amount of support that the joint will require during its treatment.

Acute arthritis.—In acute arthritis, due to a definite infecting agent, such as the gonococcus, the pathological changes in the joint differ considerably from those occurring after an injury. In the first place the effusion contains the micro-organism and also dead leucocytes—it is, in fact, pus. Further, there is an infiltration of the joint surfaces which may result in the destruction of the cartilage and in the stretching and softening of ligaments, the joint being thereby much weakened. During the acute stage gentle massage may help to diminish slightly the effusion, but movement will certainly tend to increase all the pathological changes. That is to say, if movements are carried out, there will be more effusion, more destruction of cartilage, and more softening of ligaments, and the whole process will be continued for a longer time. Movements are often advocated in these cases from the first because of the great liability to subsequent stiffness. But as this stiffness is directly due to the pathological processes the first indication is evidently to stop the progress of these, and this is best effected by a period of rest, during which the infection itself is treated by vaccines or otherwise.

Massage and gentle movements are indicated as soon as the acute inflammatory symptoms have subsided, and the extent to which the movements can be carried are best indicated by saying that they should be just sufficient to be felt to stretch the parts, without causing any considerable pain. Just as in the treatment of sprains we have neglected the uses of movement, so in an arthritis such as that due to the gonococcus, we have pushed early movement to an extent that is eventually harmful.

The aim of treatment by movement in a case of arthritis after the acute stage is passed is to gradually increase the range of movement of the joint until the normal range is attained. The period for which it is continued varies very greatly, from weeks to a year or more. It is common, however, to find a masseur wasting his time in attempting to restore movement in a joint that has been completely disorganised, and in which the joint surfaces are probably fixed together by fibrous tissue. In a case in which no apparent progress is being made an examination under an anæsthetic is indicated. This examination serves two ends. In the first place it informs us whether there is any possibility of securing additional movement, and in the second place it serves to break down any localised adhesions. If under an anæsthetic movements are obtained only with great difficulty and are never free, it may be guessed that there is definite fibrous ankylosis. In such a case any movement subsequently obtained is likely to be painful, and it is usually better to abandon the effort and to leave the joint stiff. In coming to this decision attention must of course be paid to

the joint affected and to the importance of its movement, *e.g.* a completely stiff elbow is a great disability, a completely stiff knee a much less serious thing.

Fractures.—In the treatment of fractures it is necessary to insist again upon two points. First that massage of fractures should be almost or quite painless, and second that movement means movement of the joints and not of the ends of the bones upon each other. The first objects are the prevention of effusion and the reduction of displacement. Considerable effusion and the occurrence of fracture blisters constitute the most serious difficulties in the rational treatment of fractures. It is remarkable that after the operation of osteoclasis, as also after wrenching a foot with the Thomas wrench, there is never any considerable effusion, nor do blisters occur. Yet the violence used must often be as great as is the case in many fractures. I believe that this immunity depends upon the fact that after these operations the injured part is at once covered with a firm bandage and with plaster, applied upwards from the most distal part of the limb. The effusion is thus prevented mechanically. I believe that if we were able to treat all fractures by the immediate application of firm compression bandage, we should avoid the occurrence of many of these troublesome complications. It is essential to remember that in applying such a bandage it must be taken up from the most distal part of the limb. If after an osteoclasis the plaster bandage is applied in such a way that it does not extend down to the level of the toes, it is almost certain that the fore part of the foot will swell. And if on account of this swelling the lowest part of the plaster is cut away, the swelling will extend, until the whole plaster has to be removed.

The second point to be attended to in the treatment of a fracture is the reduction of the displacement. In carrying this out it is always well to analyse the cause of the displacement in the particular fracture, as this will give a clue to the easiest method of reducing it, and will also advise us as to the probability of a recurrence of the deformity after reduction. In some cases the displacement is primarily due to the violence which caused the fracture, as, for example, in Colles's fracture. In such a case there is little if any tendency to the recurrence of deformity. A Colles's fracture if once successfully reduced does not tend to recur, and in most cases could be treated with perfect safety without any splint. In other cases the displacement is due to the pull of muscles, as, for example, in a fracture of the shaft of the femur. In such cases reduction has often to be carried out by means of extension, and it tends to recur if the extension is removed until such time as consolidation has taken place. In a third class the displacement is chiefly due to posture or to the weight of the limb, as, for example, in a fracture of the clavicle. In this case reduction is simple and the method of preventing recurrence is obvious.

The next point in the treatment of a fracture is the question of splinting. It is sometimes erroneously thought that those who advocate massage and movement in the treatment of fractures attempt to do without the use of splints. This is of course quite untrue. All that they ask is that splints should be used only for their proper purpose. This purpose is to prevent the recurrence of deformity after reduction. Splints should never be used to reduce deformity by pressure, and only occasionally should they be used to prevent deformity by posture. Their real use is to prevent such movements on the part of the patient as are likely to reproduce the displacement, and they are only necessary as long as such a recurrent displacement is possible. Just as recurrent displacement is more likely to occur in one fracture than in another, so splinting may be necessary in one case for a week, in another case for a month. In a Colles's fracture a splint is really scarcely ever necessary; it is often only used to prevent the patient using the hand; it can be removed for massage from the first, and can be discarded after a week or ten days.

In a Pott's fracture the splint can be removed for massage after a week, and can be discarded after about a fortnight. In a fracture of the femur the splint can generally be removed for massage and movement after fourteen to twenty-one days, but cannot be discarded before about the sixth week. The union of a bone by provisional callus is much more rapid than is often thought. Organisation of the effusion begins within the first forty-eight hours, and bony callus can be demonstrated in a skiagraph in from fourteen to twenty-one days. In one case of osteotomy in this hospital, treated by massage and without any splint, callus

was seen in a skiagraph taken upon the twelfth day.

To come now to the use of massage and movement. Massage can be carried on from the first, provided that no risk is run of disturbing the position. Similarly the only contra-indication for early movement of the neighbouring joints is a risk of thereby reproducing the displacement. This risk must of course vary not only with the individual fracture, but also with the manipulator, and also in the case of movements with the particular movements executed. Massage required for a fracture is a simple process and does not require any great amount of training; it can be readily carried out by the practitioner himself. He will thereby be able to arrange his splinting in such a way as to get at the part, and he will take the responsibility of any disturbance of position himself. The movements that are dangerous in any special fracture will be recognised if the cause of displacement in each case is analysed. For example, in a Colles's fracture there is practically no risk in carrying out any movement from the first. In a Pott's fracture it is well to avoid abduction and eversion of the foot in the early stages, as the structures on the inner side of the joint are torn and should not be stretched. In a fracture of the femur the weight of the limb must be carefully supported during the movements, and it is as well to keep up the extension to counteract the pull of the powerful thigh muscles. If each fracture is carefully considered in this way, and if the treatment is carried out by or under the supervision of the surgeon, practically all fractures can be safely treated by massage and movement from the first, with great benefit to the patient. Most of the opposition to these methods of treatment has arisen owing to misconception of the meaning of the terms "massage" and "movements" in relation to the treatment of fractures, and because it has often been the practice to leave this treatment in the hands of a professional masseur without any supervision.

April 9th, 1913.

DIPHTHERITIC HEMIPLEGIA.

By J. D. ROLLESTON, M.D.,
Assistant Medical Officer, Grove Fever Hospital, London.

HEMIPLEGIA is a rare occurrence in diphtheria. Out of 9075 completed cases admitted to the Grove Fever Hospital between August, 1899, and September, 1912, only six, of whom brief histories will be given, developed this complication. In all the initial attack was severe and was treated by large doses of antitoxin. All had abundant and persistent albuminuria. With the exception of Case 4, in which the hemiplegia was probably due to uræmia, all developed a well-marked cardiac lesion suggestive of an embolic origin for the hemiplegia, but in only one—Case 3—was it possible to verify this post mortem.

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CASE 2.—Girl, æt. 5 years, admitted to hospital on April 25th, 1905, with very severe faucial diphtheria on fourth day of disease. Twenty-four thousand units of antitoxin were given on admission and again on the following day. Voice nasal on tenth day. On fifteenth day the heart became dilated. On the seventeenth day right hemiplegia

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